

10/521009

Rec'd PCT/PTO 12 JAN 2005

## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau

(43) International Publication Date  
22 January 2004 (22.01.2004)

PCT

(10) International Publication Number  
WO 2004/008069 A1

(51) International Patent Classification<sup>7</sup>: G01B 11/30 (74) Agent: PLOUGMANN & VINGTOFT A/S; Sundkrogs-gade 9, P.O. Box 831, DK-2100 Copenhagen Ø (DK).

(21) International Application Number: PCT/DK2003/000457 (81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DB (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 1 July 2003 (01.07.2003) (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data: 60/395,324 12 July 2002 (12.07.2002) US

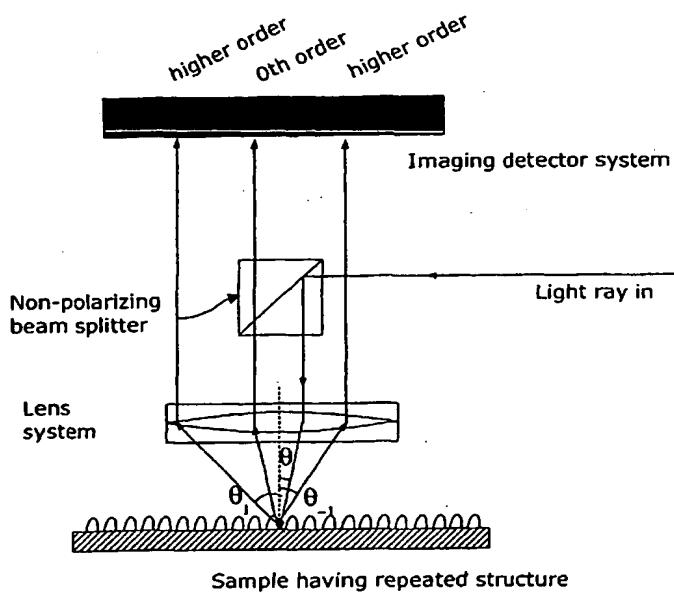
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(54) Title: METHOD AND APPARATUS FOR OPTICALLY MEASURING THE TOPOGRAPHY OF NEARLY PLANAR PERIODIC STRUCTURES



(57) Abstract: The present invention discloses a non-destructive method and apparatus for measuring the 3D topography of a sample having periodic microstructure deposited onto the surface, or deposited onto a film, or buried into the film or sample. In particular, the present invention relates to an optical system and method utilizing polarized light beam, diffracted from the repeated structure, to measure its spatial geometry giving parameters such as profile height, profile widths, sidewall angles, and arbitrary profile shape. The optical system employs a broadband or semi-monochromatic light source to produce a light beam that is polarized and focused onto the periodic structure being measured. The focused beam consists of a whole range of illumination angles that is provided to the structure simultaneously. Transmitted or reflected diffracted light generated by the interaction of the light with the periodic structure is collected by an imaging detector system. The detector records the diffraction light irradiance resolved into illumination angles, diffraction orders and wavelength. The data is applied to determine the geometrical profile of the periodic structure using a reconstruction algorithm that is based on comparisons between measured diffraction data and modeled diffraction irradiance of a profile model using Maxwell's equations. The reconstruction of the profile is performed by iterative adjustments of a profile seed model until the modeled diffraction irradiance matches the measured data within a predefined convergence tolerance.

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